

What is claimed is:

- 532
1. A disk drive, comprising:  
a magnetic disk having a data storage region; and  
an actuator arm assembly including an actuator arm, a flexure arm mounted to a first  
end of said actuator arm, and a read element and a write element mounted to an end of said  
flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a  
second end of said actuator arm,  
wherein said read element has a read element skew angle and said write element has  
a write element skew angle, and  
wherein at least one of said read element skew angle and said write element skew  
angle is zero degrees when said read element and said write element are located off of said  
data storage region.
  2. A disk drive, as claimed in claim 1, wherein said data storage region contains  
a plurality of concentric tracks which include sectors, said sectors including data sectors and  
servo sectors, and wherein said servo sectors are written in a non-radially coherent manner.
  3. A disk drive, as claimed in claim 1, wherein said data storage region contains  
a plurality of concentric tracks which include sectors, said sectors including data sectors and  
servo sectors, and wherein said servo sectors are printed on said magnetic disk surface prior  
to assembly into said disk drive.

4. A disk drive, as claimed in claim 1, wherein at least one of said read element and said write element is mounted on said flexure arm such that such that at least one of said read element and said write element is not perpendicular to a centerline of said flexure arm.

5. A disk drive, as claimed in claim 1, wherein an angle at which said flexure arm is mounted to said actuator arm is selected such that at least one of said read element skew angle and said write element skew angle is zero degrees when said read element and said write element are located off of said data storage region.

6. A disk drive, as claimed in claim 1, wherein the length of said actuator arm assembly is selected such that at least one of said read element skew angle and said write element skew angle is zero degrees when said read element and said write element are located off of said data storage region.

7. A disk drive, comprising:  
a magnetic disk having a data storage region; and  
an actuator arm assembly including an actuator arm, a flexure arm mounted to a first end of said actuator arm, and a read element and a write element mounted to an end of said flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a second end of said actuator arm,  
5 wherein at least one of said read element and said write element is mounted to said flexure arm such that a skew angle of at least one of said read element and said write element

relative to said data storage region is greater than 30 degrees for the entire data storage region.

8. A disk drive, as claimed in claim 7, wherein at least one of said read element and said write element is mounted to said flexure arm such that said skew angle of at least one of said read element and said write element is greater than 45 degrees for the entire data storage region.

9. A disk drive, as claimed in claim 7, wherein at least one of said read element and said write element is mounted to said flexure arm such that said skew angle of at least one of said read element and said write element is greater than 60 degrees for the entire data storage region.

10. A disk drive, as claimed in claim 7, wherein said data storage region includes a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are written in a non-radially coherent manner.

11. A disk drive, as claimed in claim 7, wherein said data storage region includes a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are printed on said magnetic disk surface prior to assembly into said disk drive.

12. A disk drive, as claimed in claim 7, wherein a tolerance of at least one of said read and write elements is increased by the inverse cosine of said skew angle of at least one of said read element and said write element .

13. A disk drive, as claimed in claim 7, a width of at least one of said read and write elements is increased by the inverse cosine of said skew angle of at least one of said read element and said write element.

14. A disk drive, as claimed in claim 7, wherein a signal-to-noise ratio produced by said read element is at least 6 dB.

15. A disk drive, as claimed in claim 7, wherein said data storage region includes a plurality of concentric data tracks, each of said plurality of concentric data tracks having a width associated therewith, wherein the width of said plurality of concentric data tracks corresponds to the cosine of said skew angle of said write head.

16. A disk drive, as claimed in claim 15, wherein said write element has a first width,

wherein the width of said plurality of concentric data tracks corresponds to the product of said first width and the cosine of said skew angle of said write element.

17. A disk drive, comprising:  
a magnetic disk having a data storage region; and  
an actuator arm assembly including an actuator arm, a flexure arm mounted to a first  
end of said actuator arm, and a read element and a write element mounted to an end of said  
5 flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a  
second end of said actuator arm,

wherein said flexure arm is mounted to said actuator arm such that a skew angle of  
at least one of said read and write elements is greater than 30 degrees for the entire data  
storage region.

18. A disk drive, as claimed in claim 17, wherein said flexure arm is mounted to  
said actuator arm such that said skew angle of at least one of said read and write elements  
is greater than 45 degrees for the entire data storage region.

19. A disk drive, as claimed in claim 17, wherein said flexure arm is mounted to  
said actuator arm such that said skew angle of at least one of said read and write elements  
is greater than 60 degrees for the entire data storage region.

20. A disk drive, as claimed in claim 17, wherein said data storage region includes  
a plurality of concentric data tracks which include sectors, said sectors including data sectors  
and servo sectors, and wherein said servo sectors are written in a non-radially coherent  
manner.

21. A disk drive, as claimed in claim 17, wherein said data storage region includes a plurality of concentric data tracks which include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are printed on said magnetic disk surface prior to assembly into said disk drive.

22. A disk drive, as claimed in claim 17, wherein said a read element has a first width and said write element has a second width, wherein a tolerance of at least one of said first and second widths is increased by the inverse cosine of said skew angle of at least one of said read and write elements.

23. A disk drive, as claimed in claim 22, wherein a signal-to-noise ratio produced by said read element is at least 6 dB.

24. A disk drive, as claimed in claim 17, wherein said data storage region includes a plurality of concentric data tracks, wherein the width of said plurality of concentric data tracks corresponds to the cosine of said skew angle of said write element.

25. A disk drive, as claimed in claim 17, wherein said read element has a first width and said write element has a second width, and at least one of said first and second widths is increased by the inverse cosine of said skew angle of at least one of said read and write elements.

26. A hard disk drive, comprising:  
a magnetic disk having a data storage region including a plurality of concentric data tracks; and  
an actuator arm assembly including an actuator arm, a flexure arm mounted to a first  
5 end of said actuator arm, and a head mounted to an end of said flexure arm opposite said  
actuator arm, said head having a read element and a write element, wherein said actuator arm  
assembly rotates about a second end of said actuator arm,  
wherein the length of said actuator arm assembly is such that a skew angle of said  
read element and write element relative to said data tracks at an inner diameter of said data  
10 storage region is at least 35 degrees greater than a skew angle at an outer diameter of said  
data storage region.

27. A disk drive, as claimed in claim 26, wherein the length of said actuator arm  
assembly is such that said skew angle at said inner diameter of said data storage region is at  
least 45 degrees greater than said skew angle at said outer diameter of said data storage  
region.

28. A disk drive, as claimed in claim 26, wherein the length of said actuator arm  
assembly is such that said skew angle said inner diameter of said data storage region is at  
least 60 degrees greater than said skew angle at said outer diameter of said data storage  
region.

29. A disk drive, as claimed in claim 26, wherein the length of said actuator arm assembly is such that said skew angle at said outer diameter of said data storage region is approximately zero degrees, and said skew angle at said inner diameter is at least 35 degrees.

30. A disk drive, as claimed in claim 26, wherein said plurality of concentric tracks include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are written in a radially coherent manner.

31. A disk drive, as claimed in claim 26, wherein said plurality of concentric tracks include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are printed on said magnetic disk surface prior to assembly into said disk drive.

32. A disk drive, comprising:

a magnetic disk having a data storage region including a plurality of concentric data tracks, said plurality of data tracks having associated track widths; and

an actuator arm assembly including an actuator arm, a flexure arm mounted to a first end of said actuator arm, and a head mounted to an end of said flexure arm opposite said actuator arm, said head having a read element and a write element, wherein said actuator arm assembly rotates about a second end of said actuator arm,

wherein the width of at least one of said write element and said read element is greater than said track width for each of said plurality of concentric data tracks.



33. A disk drive, as claimed in claim 32, wherein said plurality of concentric tracks include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are written in a non-radially coherent manner.

34. A disk drive, as claimed in claim 32, wherein said plurality of concentric tracks include sectors, said sectors including data sectors and servo sectors, and wherein said servo sectors are printed on said magnetic disk surface prior to assembly into said disk drive.

35. A disk drive, as claimed in claim 32, wherein said head is mounted on said flexure arm such that at least one of said read element and said write element is not perpendicular to a centerline of said flexure arm.

36. A disk drive, as claimed in claim 35, wherein an angle at which said head is mounted to said flexure arm is selected such that a skew angle of said read and write elements relative to said data tracks is zero degrees when said head is located off of said data storage region.

37. A disk drive, as claimed in claim 35, wherein said head is mounted to said flexure arm such a said skew angle is greater than 30 degrees for each of said plurality of concentric data tracks.

38. A disk drive, as claimed in claim 35, wherein said head is mounted to said flexure arm such that a skew angle is greater than 45 degrees for each of said plurality of concentric data tracks.

39. A disk drive, as claimed in claim 35, wherein said head is mounted to said flexure arm such that a skew angle is greater than 60 degrees for each of said plurality of concentric data tracks.

40. A disk drive, as claimed in claim 32, wherein the length of said actuator arm assembly is selected such that a skew angle of said read and write elements relative to said data tracks is zero degrees when said head is located off of said data storage region.

41. A disk drive, as claimed in claim 32, wherein an angle at which said flexure arm is mounted to said actuator arm is selected such that a skew angle of said read and write elements is zero degrees when said head is located off of said data storage region.

42. A disk drive, as claimed in claim 41, wherein said flexure arm is mounted to said actuator arm such said skew angle is greater than 30 degrees for each of said plurality of concentric data tracks.

43. A disk drive, as claimed in claim 41, wherein said flexure arm is mounted to said actuator arm such said skew angle is greater than 45 degrees for each of said plurality of concentric data tracks.

44. A disk drive, as claimed in claim 41, wherein said flexure arm is mounted to said actuator arm such said skew angle is greater than 60 degrees for each of said plurality of concentric data tracks.

45. A method for increasing the tolerance of a read element in a disk drive, comprising:

providing a head having said read element, said read element having a nominal width and a width tolerance; and

skewing said read element to a minimum skew angle relative to a first data track located in a data storage region of a magnetic disk surface such that said width tolerance is increased by approximately the inverse cosine of said skew angle.

46. A method, as claimed in claim 45, wherein said skewing step includes: selecting said skew angle such that said width tolerance is increased by at least 30 per cent.

47. A method, as claimed in claim 45, wherein said skewing step includes:  
selecting a skew angle such that said width tolerance is increased by at least 50 per cent.

48. A method, as claimed in claim 45, wherein said skewing step includes:  
selecting a skew angle such that said width tolerance is increased by at least 100 per cent.

49. A method for increasing physical head element widths in a disk drive,  
comprising:

providing a head having a read element having a first physical width and a write  
element having a second physical width; and

5 skewing said head such that said read element has a first effective width and said  
write element has a second effective width, wherein said first and second effective widths  
are reduced compared to said first and second physical widths.

50. A method, as claimed in claim 49, further comprising:  
reducing a track width to correspond to said first and second effective widths.

51. A method, as claimed in claim 49, wherein said skewing step includes:  
selecting a skew angle such that said first and second effective widths are 70 percent  
of said first and second physical widths.

52. A method, as claimed in claim 51, wherein said skewing step includes:  
selecting a skew angle such that said first and second effective widths are 60 percent  
of said first and second physical widths.

53. A method, as claimed in claim 49, wherein said skewing step includes:  
selecting a skew angle such that said first and second effective widths are 50 percent  
of said first and second physical widths.

54. A method for decreasing track widths on magnetic media in a disk drive,  
comprising:

providing a head having an element, said element having a nominal width;

skewing said element to a minimum skew angle relative to a plurality of data tracks

5 located in a data storage region of said magnetic media such that an effective width of said  
element relative to said data tracks is reduced as compared to said nominal width; and

selecting a track width of said data tracks to correspond to said effective width.

55. A method, as claimed in claim 54, further comprising:

selecting said skew angle such that said track width is narrower than said nominal  
width.

56. A method, as claimed in claim 54, wherein said selecting step includes:  
reducing said track width relative to a nominal track width which corresponds to said  
nominal width.

57. A method, as claimed in claim 56, wherein said reducing step includes:  
reducing said track width by at least 30 percent.

58. A method, as claimed in claim 56, wherein said reducing step includes:  
reducing said track width by at least 40 percent.

59. A method, as claimed in claim 56, wherein said reducing step includes:  
reducing said track width by at least 50 percent.

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63